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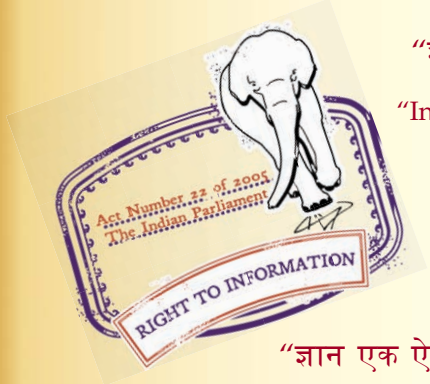

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
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"Knowledge is such a treasure which cannot be stolen"

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भारतीय मानक

टिन प्लेट या विद्युत अपघटन द्वारा क्रोमियम/क्रोमियम ऑक्साइड-लेपित इस्पात के उत्पादन हेतु अतप्त बेल्लित कुंडलीकृत ब्लैकप्लेट

Indian Standard

COLD-REDUCED BLACKPLATE IN COIL FORM FOR THE PRODUCTION OFTINPLATE OR ELECTROLYTIC CHROMIUM/CHROMIUM OXIDE-COATED STEEL

ICS 77.140.50

BUREAU OF INDIAN STANDARDS
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NEW DELH1110002

April 2009 Price Group 6

Wrought Steel Products Sectional Committee, MTD 4

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 11951 :1995 'Cold-reduced blackplate in coil form for the production of tinplate or electrolytic chromium/chromium oxide-coated steel' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Wrought Steel Products Sectional Committee and approval of the Metallurgical Engineering Division Council.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker in the International Standard while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standard for which Indian Standard also exists. The corresponding Indian Standard which are to be substituted in their places are listed below along with their degree of equivalence for the edition indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IS01024 :1989 Metallic materials — Hardness test — Rockwell superficial test {scales 15 N, 30 N, 45 N, 15T, 30 T and 45 T)	IS 1586 : 2000 Method for Rockwell hardness test for metallic material (scales A-B-C-D-E-F-G-H-K- 15 N, 30 N, 45 N, 15 T, 30T and 45 T) *{third revision)*	Technically Equivalent
ISO 6892:1984 Metallic materials — Tensile testing	IS 1608 : 2005 Metallic materials — Tensile testing at ambient temperature *{third revision)*	do
ISO 11949 : 1995 Cold-reduced electrolytic tinplate	IS 1993 : 2006 Cold-reduced electrolytic tinplate *{fourth revision)*	Identical
ISO 11950 : 1995 Cold-reduced electrolytic chromium/chromium oxide-coated steel	IS 12591 : 2006 Cold-reduced electrolytic chromium/chromium oxide-coated steel *{first revision)*	do

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values *{revised)'.*

Indian Standard

COLD-REDUCED BLACKPLATE IN COIL FORM FOR THE PRODUCTION OF TINPLATE OR ELECTROLYTIC CHROMIUM/CHROMIUM OXIDE-COATED STEEL

1 Scope

This International Standard specifies requirements for single and double cold-reduced blackplate in the form of coils which are intended for manufacturing tinplate or electrolytic chromium/chromium oxide-coated steel (ECCS) in accordance with ISO 11949 or ISO 11950.

Single-reduced blackplate is specified in nominal thicknesses that are multiples of 0,005 mm, from 0,17 mm up to and including 0,49 mm. Double-reduced blackplate is specified in nominal thicknesses that are multiples of 0,005 mm, from 0,14 mm up to and including 0,29 mm.

This International Standard applies to coils in nominal minimum widths of 500 mm, with either trimmed or untrimmed edges

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this international Standard. At the time of publication, the editions indicated were valid. Ali standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of I EC and ISO maintain registers of currently valid International Standards.

ISO 1024:1989, *Metallic materials — Hardness test — Rockwell superficial test (scales 15N. 30N, 45N, 1ST, 30Tand45T).*

ISO 6892:1984, *Metallic materials — Tensile testing.*

ISO 11949:1995, *Cold-reduced Electrolytic tinplate.*

ISO 11950:1995, *Cold-reduced electrolytic chromium/ chromium oxide-coated steel.*

3 Definitions

For the purposes of this international Standard, the following definitions apply.

3.1 blackplate: Cold-reduced low-carbon mild steel, normally oiled, for the production of tinplate or ECCS in accordance with ISO 11949 or ISO 11950.

3.2 single coid-reduced: Term used to describe blackplate which has been reduced to the desired thickness in a cold-reduction mill and subsequently annealed and temper rolled.

3.3 double cold-reduced: Term used to describe blackplate which has had a second major reduction after annealing.

3.4 batch annealed; box annealed (BA): Annealed by the process in which the cold-reduced strip is annealed in tight coil form, within a protective atmosphere, for a predetermined time-temperature cycle.

3.5 continuously annealed (CA): Annealed by the process in which coid-reduced coils are unwound and annealed in strip form within a protective atmosphere.

3.6 finish: Appearance of the surface of blackplate, resulting from controlled preparation of the work rolls used for the final stages of rolling.

3.6.1 shot blast finish: Finish resulting from the use of temper-mill work rolls that have been shot blasted.

3.6.2 smooth finish: Finish resulting from the use of temper-mill work rolls that have been ground to a high degree of polish. This finish is used for the production of bright finish tinplate.

3.6.3 stone finish: Finish characterized by a directional pattern, resulting from the use of final-mill work rolls that have been ground to a lower degree of polish than those used for the smooth finish.

3.7 coil: Rolled flat strip product which is wound into regularly superimposed laps so as to form a coil with almost flat sides.

3.8 longitudinal bow; line bow: Residual curvature in the strip remaining along the direction of rolling.

3.9 transverse bow; cross bow: Mode of curvature in the strip such that the distance between its edges parallel to the direction of rolling is less than the strip width.

3.10 centre buckle; full centre: Intermittent vertical displacement or wave in the strip occurring other than at the edges.

3.11 edge wave: Intermittent vertical displacement occurring at the strip edge when the strip is laid on a flat surface. This parameter is only applicable to material supplied with trimmed edges.

3.12 feather edge; transverse thickness profile: Variation in thickness, characterized by a reduction in thickness close to the edges, at right angles to the direction of rolling. This parameter is only applicable to material supplied with trimmed edges.

3.13 burr: Metal displaced beyond the plane of the surface of the strip by shearing action.

3.14 roiling width: Width of the strip perpendicular to the direction of rolling.

3.15 consignment: Quantity of material of the same specification made available for dispatch at the same time.

3.16 pallet: Base platform on which a coil is placed to facilitate ready transportation.

3.17 anvil effect: Effect which a hard anvil can produce on the numerical hardness value obtained when a hardness test is performed on very thin material supported on such an anvil.

4 Information to be supplied by the purchaser

4.1 General

The following information shall be given in the enquiry and order to assist the manufacturer in supplying the correct material:

a) the designation as given in clause 5 excluding the annealing code, unless a specific type of annealing is required;

b) the quantity, expressed on a mass basis;

c) for single-reduced blackplate, the finish required (see 6.2.1);

d) the orientation of the coils on delivery, i.e. with the cores vertical or horizontal {see clause 14);

e) whether the.coil shall be supplied with the edges trimmed or not.

NOTE 1 Appropriate classifications are suitable for shaping operations such as stamping, drawing, folding, beading and bending, and assembly work such as joint forming and welding. The end use should be borne in mind when the classification is selected.

4.2 Options

in the event that the purchaser does not indicate his wish to implement any of the options included in this International Standard and does not specify his requirements at the time of the enquiry and order, the product shall be supplied on the following basis:

a) for double-reduced blackplate, with a stone surface finish (see 6.2.2);

b) the location of each joint shall be indicated by a piece of non-rigid material and punched holes (see 10.3):

c) coated with a suitable oil (see 6.3);

d) with an internal diameter of either 420 mm or 508 mm (see clause 14).

4.3 Additional information

When ordering, the user shall supply all the necessary information concerning

a) his production facilities which he anticipates will be appropriate to the ordered blackplate;

b) the intended end use.

5 Designation

5.1 Single-reduced blackplate

For the purposes of this International Standard, single-reduced blackplate is designated in terms of a temper classification based on the Rockwell HR30Tm hardness values given in table 1.

Single-reduced material covered by this International Standard shall be designated by the following characteristics in the given sequence:

a) a description of the material (i.e. blackplate coil);

b) the number of this International Standard;

c) the temper designation in accordance with table 1;

d) the type of annealing used by the manufacturer (see 8.1);

e} the type of finish (see 3.6);

f) the dimensions of the thickness and width, in millimetres;

g) whether mill edge or trimmed.

EXAMPLE

Blackplate ISO 11951 - TH61 - CA - stone -0,20 x 800 trimmed.

5.2 Double-reduced blackplate

For the purposes of this International Standard, double-reduced blackplate is designated in terms of mechanical property classifications based on 0,2 % proof stress given in table 2.

Double-reduced material covered by this International Standard shall be designated by the following characteristics in the given sequence:

a) a description of the material (i.e. blackplate coil);

b) the number of this International Standard;

c) the mechanical property designation (see table 2);

d) the type of annealing used by the manufacturer (see 8.1);

e) the dimensions of the thickness and width, in millimetres;

f) whether mill edge or trimmed.

EXAMPLE

Blackplate ISO 11951 - T620 - CA - 0,18 x 750 mill edge.

Table 1 — Hardness values (HR30Tm) for single-reduced blackplate

Steel grade (previous designation)	$e \leq 0,21$		$0,21 < e \leq 0,28$		$e > 0,28$	
	Nominal	Range for sample average	Nominal	Range for sample average	Nominal	Range for sample average
TH50 (T50)	53 max.		52 max.		51 max.	
TH52 (T52)	53	± 4	52	± 4	51	± 4
TH55 (T55)	56	± 4	55	± 4	54	± 4
TH57 (T57)	58	± 4	57	± 4	56	± 4
TH61 (T61)	62	± 4	61	± 4	60	± 4
TH65 (T65)	65	± 4	65	± 4	64	± 4

NOTES

1 It is important to distinguish HR30Tm from HR30T, the former denoting that depressions on the under surface of the test piece are permitted (cf. ISO 1024).

2 e is the thickness, in millimetres.

Table 2 — Proof stress values of double-reduced blackplate

Steel grade (previous designation)	Average 0,2 % proof stress	
	Nominal N/mm²	Permitted range N/mm²
T550 (DR550)	550	480 to 620
T580 (DR580)	580	510 to 650
T620 (DR620)	620	550 to 690
T660 (DR660)	660	590 to 730
T690 (DR690)	690	620 to 760

6 Manufacturing features

6.1 Manufacture

The methods of manufacture of blackplate are the province of the manufacturer and are not specified in this International Standard.

The purchaser shall be informed if any alteration is made to the method of manufacture that will affect the coating operation and the properties of the blackplate.

NOTE 2 it is recommended that the manufacturer supplies to the purchaser such details of the manufacturing process as may assist the purchaser in his efficient use of the blackplate.

6.2 Finish

6.2.1 Single-reduced blackplate

Single cold-reduced blackplate can be supplied with either a smooth, stone, or shot blast finish, and the finish required shall be specified at the time of ordering [see 4.1 c)].

6.2.2 Double-reduced blackplate

Double cold-reduced blackplate is usually supplied with a stone surface finish (see 3.6.3).

6.3 Oiling

To avoid corrosion, blackplate shall normally be supplied with a sufficient layer of a suitable, non-mineral, protective oil. The oil shall be removed by an adequate inline cleaning process before any subsequent coating.

if blackplate is required without an oi! coating, this shall be indicated at the time of ordering [see 4.2 c)].

NOTE 3 if unoiled blackplate is supplied, there is an increased risk of surface corrosion.

6.4 Defects

The producer is expected to employ his normal quality control and line inspection procedures to ensure that the blackplate manufactured is in accordance with the requirements of this International Standard.

However, the production of blackplate coils in continuous-strip mill operations does not afford the opportunity for removal of all blackplate that does not comply with the requirements of this International Standard.

!f, when processing blackplate coil, the user (or his agent) encounters recurring defects which are incompatible with the end use (see 4.3 b)], it is essential, where practicable, that he stops processing the coil and advises the supplier.

The purchaser is expected to have adequate handling and roller levelling equipment and inspection facilities, and to take reasonable care during these operations.

7 Specific requirements

Standard grade blackplate shall comply with the appropriate requirements of clauses 8 to 10.

When tests are carried out to verify compliance with the requirements of clauses 8 and 9, sample sheets shall be selected from consignments in accordance with clause 11.

Coils shall be dispatched as described in 14.

8 Mechanical properties

8.1 General

For the purposes of this International Standard, single-reduced' blackplate is classified into temper grades based on Rockwell HR30Tm hardness values and double-reduced blackplate classification is based on the 0,2 % proof stress properties.

Other mechanical properties will significantly influence the performance of blackplate in processing, and the subsequent intended end use will vary depending on the steel type and the methods of casting, annealing and temper rolling employed.

NOTE 4 By agreement, the type of annealing for blackplate, i.e. BA or CA (see 3.4 or 3.5) may be specified when ordering.

8.2 Single-reduced blackplate

The hardness values for single-reduced blackplate shall be as given in table .1, when tested as described in B.3.

8.3 Double-reduced blackplate

The proof stress shall be as given in table 2, when tested as described in 12.2.

NOTE 5 For routine testing, the proof stress may be determined using the springback test as described in annex A. However, in cases of dispute, the method described in 12.2 is used.

9 Tolerances on dimensions and shape

9.1 General

Tolerances on dimensions (i.e. thickness and linear dimensions) and shape (i.e. edge camber, lateral weave) are specified in 9.2 to 9.5, together with appropriate methods of measurement

9.2 Coil width

The width of the coil shall be measured across each sample sheet, selected in accordance with clause 11, to the nearest 0,5 mm. The width shall be measured across the centre of the sample sheet, at right angles to the direction of rolling, with the sample sheet lying on a flat surface. The measured width shall be not less than the ordered width and shall not exceed the ordered width by more than 3 mm for trimmed coil.

9.3 Coil thickness

9.3.1 General

The transverse thickness profile shall be measured using the micrometer method described in 12.1.2. All other thicknesses shall be determined by the weighing method (see 12.1.1) or by direct measurement using the micrometer method. However, in cases of dispute and for all retests, except for the transverse thickness profile, the weighing method shall be used.

9.3.2 Thickness variation

The thickness of sample sheets shall not deviate from the nominal thickness of the coil by more than ±8,5%.

9.3.3 Average thickness of a consignment

The average thickness of a consignment determined by the weighing method described in 12.1.1 on the sample sheets selected in accordance with 11.2, shall not deviate from the ordered nominal thickness by more than

a) ± 2,5 % for consignments comprising more than 15 000 m; or

b) ± 4 % for consignments comprising 15 000 m or less.

9.3.4 Thickness variation across the width

The thickness of each of the two individual test pieces, determined in accordance with 12.1.1, shall not deviate from the actual average thickness of the whole sample sheet by more than 4 %.

NOTE 6 This is only applicable to blackplate supplied as trimmed.

9.3.5 Feather edge (transverse thickness profile)

The minimum thickness, when measured by the micrometer method described in 12.1.2, shall not differ from the actual centre thickness of the sample sheet by more than 8 %.

NOTE 7 This is only applicable to blackplate supplied as trimmed.

9.4 Edge camber of trimmed coils

Edge camber is the maximum deviation (in the plane of the sheet) of an edge from a straight line forming a chord to its extremities (see figure 1).

The edge camber, expressed as a percentage of the chord length, is calculated using the following formula:

$$\text{Edge camber} = \frac{\text{Deviation } (D)}{\text{Length of chord (6 m)}} \times 100$$

The edge camber, measured over a distance (chord length) of 6 m, shall not exceed 0,1 % {i.e. 6 mm).

9.5 Lateral weave (short pitch camber) of coils

Lateral weave is the deviation of a mill-trimmed edge from a straight line lying in the same plane and forming a chord to it over a relatively short distance.

The lateral weave, measured over a chord length of 1 m, shall not exceed 1.0 mm when measured prior to shearing.

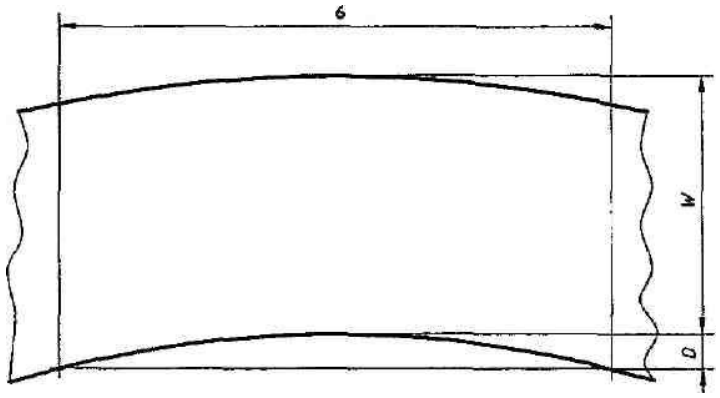
NOTE 8 If the coil is used for scroll shearing, the permissible values should be agreed upon between the manufacturer and purchaser.

10 Joints within a coil

10.1 General

The producer shall ensure continuity of the coils within the limits of the mass ordered, if necessary by means of electrically welded joints made after cold reduction. Requirements relating to the numbers, locations and dimensions of the joints permitted within a coil are given in 10.2 to 10.4.

Dimensions in metres



W: rolling width

D: deviation from a straight line

Figure 1 — **Edge camber of coils**

10.2 Number of joints

The number of joints in a coil shall not exceed three in lengths of 10 000 m.

10.3 Location of joints

The location of each joint in a coil shall be indicated clearly.

NOTE 9 The location of each joint may be indicated, for example by the insertion of a piece of non-rigid material and punched holes. However, alternative methods may be agreed between the producer and purchaser at the time of enquiry and order.

10.4 Dimensions of joints

10.4.1 Thickness

The total thickness of any joint shall not exceed three times the nominal thickness of the material forming the joint.

10.4.2 Overlap

In any lap joint, the total length of overlap shall not exceed 10 mm. The free overlap shall not exceed 5 mm (see figure 2).

11 Sampling

11.1 General

When tests are carried out to assess compliance with the requirements for surface appearances {see 6.2, tolerances on dimensions and shape (see clause 9) and mechanical properties (see clause 8), sample sheets of the blackplate coil shall be selected in accordance with 11.2. Before any tests are carried out the oil shall be removed.

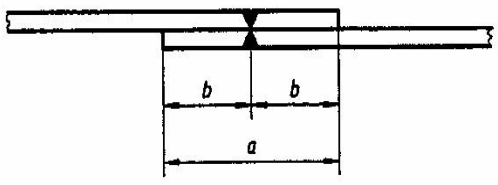
11.2 Selection of sample sheets

Samples shall be taken from each coil, at a distance not less than 5 m from the coil end,

a) for verification of mechanical properties: two sheets;

b) for verification of the dimensions, shape and surface: five sheets.

Direction of rolling



a: total length of overlap

b: free overlap

Figure 2 — Joint overlap

12 Test methods

12.1 Thickness

12.1.1 Weighing method for determination of thickness

12.1.1.1 Determine the thickness of each sample sheet as follows:

a} weigh the sheet to give the mass, to the nearest 2g;

b) measure the length and width of the sheet, to the nearest 0,5 mm, and calculate the area;

c) calculate the thickness of the sheet, to the nearest 0,001 mm, using the following formula:

Thickness (mm) =

$$= \frac{\text{Mass (g)}}{\text{Area (mm}^2\text{)} \times 0{,}007\,85\ \text{(g/mm}^3\text{)}}$$

12.1.1.2 To determine the average thickness for a consignment, calculate the arithmetic mean of the calculated thicknesses of all the sample sheets representing the consignment.

12.1.1.3 To determine the variation in thickness within each sample sheet, take two test pieces Y {see figure 3) from the sheet. Weigh each test piece to the nearest 0,01 g, measure the length and width of each test piece to the nearest 0,1 mm, and calculate the thickness of each test piece to the nearest 0,001 mm using the formula given in 12.1.1.1 c).

12.1.2 Micrometer method for measurement of the thickness of trim med coil

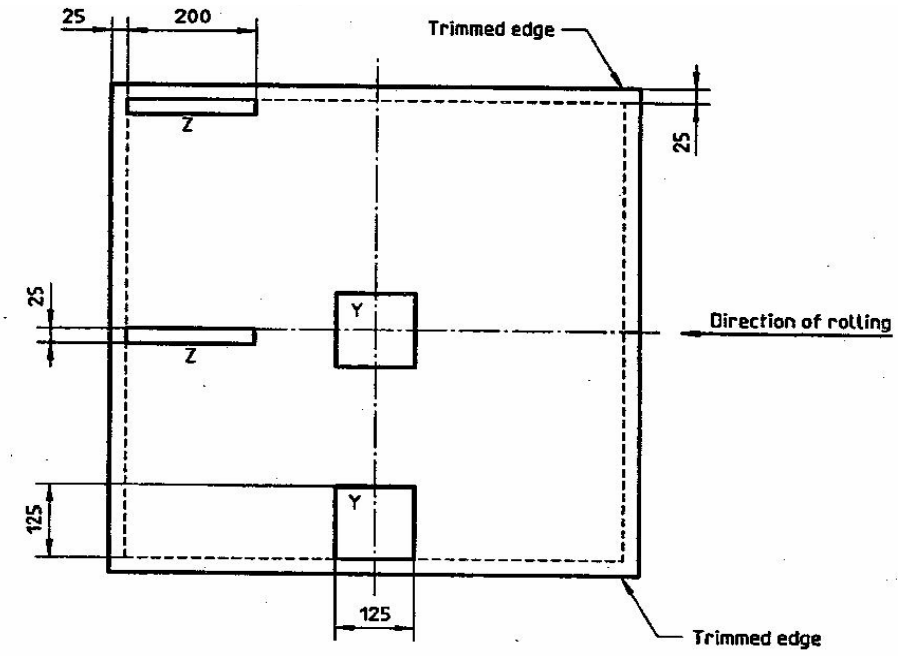
Measure the thickness using a hand-operated, spring-loaded micrometer to an accuracy of 0,001 mm:

a) for transverse thickness profile, 6 mm from the trimmed edge;

b) for all other thicknesses, at least 10 mm from the trimmed edge.

NOTE 10 It is recommended that the micrometer should have a ball-ended shank and a curved-surface base anvil.

Dimensions in millimetres



Y: test pieces for hardness and determination of local thickness variation within a sheet

Z: test pieces for tensile or springback tests

Figure 3 — Location of test pieces

12.2 Tensile tests

12.2.1 Test pieces

For each sheet selected in accordance with clause 11, cut two rectangular test pieces approximately 200 mm x 25 mm wide with the rolling direction parallel to the length of the test piece, at positions marked Z in figure 3. Ensure that the edge test pieces clear the edges of the sheet by a minimum of **25** mm.

12.2.2 Test method

Determine the 0,2 % proof stress as described in ISO 6892 using the conditions specified in annex B of ISO 6892:1984 for thin products and test.piece type 1, i.e. width 12,5 mm ± 1 mm and original gauge length L_0, of 50 mm.

Carry out one test on each of the test pieces selected in accordance with 12.2.1, i.e. two tests per sheet selected.

Calculate the representative proof stress for the consignment as the arithmetic mean of all the proof stress results on all the sample sheets taken from the consignment.

13 Retests

If any of the results obtained are unsatisfactory, the measurements for that particular property shall be repeated twice on new sample sheets taken at a distance not less than 15 m from the coil end. If the results on both repeated tests meet the stated requirements, the consignment represented shall be deemed to comply with this International Standard, but if the results of either of the retests fail to meet the stated requirements, the consignment represented shall be deemed not to comply with this International Standard.

14 Dispatch and packaging

Coil shall be dispatched with their cores in either a vertical or horizontal position [see 4.1 d)]. The orientation shall be specified at the time of ordering. The internal diameters of the coils shall be either {420 !!<•) mm or (508 +J§) mm.

NOTES

11 Blackplate strip is usually supplied in consignments of coils with outside diameters of at least 1200 mm, but a limited number of coils with smaller outside diameters may be included in the consignment.

12 If coils with a different internal diameter are required, this should be indicated at the time of ordering [see 4.2 d)].

Annex A
(normative)

Springback test for routine determination of proof stress for double-reduced material

This is not the reference method. In alt cases of dispute, the method described in 12.2 (i.e. according to ISO 6892) is to be used.

A.1 Principle

The springback test provides a simple and rapid means of estimating the tensile yield strength of double-reduced products from measurement of thickness and angle of springback of a rectangular strip test piece, after bending through 180° around a cylindrical mandrel and then releasing.

A.2 Test pieces

The test pieces used are identical to those for the tensile test described in 12.2.1.

A.3 Test method

Make one test on each of the test pieces obtained in accordance with A.2 (i.e. two tests per sheet selected). Carry out the test using the Springback Temper Tester model G.67[1)].

In making the test, strictly observe the operational instructions provided with the Springback Temper Tester. The principal steps in the test are:

a) measure the thickness of the blackpfate test piece, to the nearest 0,001 mm;

b) insert the test piece into the tester and fix it firmly in the testing position by gently tightening the clamping screw using light finger pressure;

c) bend the test piece through an angle of 180° around the mandrel by a gentle swing of the forming arm;

d) return the forming arm to its "start" position and read and record the springback angle by sighting directly over the test piece;

e) remove the test piece from the tester and, using the recorded thickness of the test piece and the springback angle, determine the appropriate springback index value from a suitable conversion formula {e.g. Bower) agreed between the producer and purchaser.

NOTE 13 Calibrate each new Springback Temper Tester using the standard tensile test {see 12.2) or another "reference" Springback Temper Tester. In addition, since malfunctions arising, for example from excessive wear or inadvertent abuse of the test equipment, may not be readily apparent, it is recommended that the Springback Temper Test readings should be regularly compared with readings from the standard tensile test or a "reference" Springback Temper Tester. It js also recommended that such direct cross-checks be further supplemented by the frequent use of reference blackplate samples of known proof stress.

l) The Springback Temper Tester model G.67 is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

Annex B
(informative)

Recommended Rockwell hardness values for double-reduced blackplate

B.1 General

Recommended hardness values, determined as described in B.2 and B.3, are given in table B.1.

Table B.1 — Hardness values (HR30Tm) for double-reduced blackplate

Steel grade (previous designation)	Average Rockwell hardness (HR30Tm)[1]	
	Nominal	Range for sample average
T550 (DR 550)	73	±3
T580 (DR 580)	74	±3
T620 (DR 620)	76	±3
T660 (DR 660)	77	±3
T690 (DR 690)	80	±3

1) It is important to distinguish HR30Tm from HR30T, the former denoting that depressions on the under surface of the test piece are permitted (cf. ISO 1024).

B.2 Test pieces

From each of the sample sheets obtained in accordance with clause 11, take two test pieces 125 mm x 125 mm from the positions marked Y in figure 3.

NOTE 14 The test pieces (Y) taken for the determination of thickness variations within the individual sample sheets may also be used for the hardness determinations, where appropriate.

Before carrying out the hardness tests in accordance with B.3, artificially age the specimens at 200 °C for 20 min.

Polish plate with a shot blast finish using ornery paper of grade 600.

B.3 Test method

Determine the Rockwell HR30Tm indentation hardness either

a) directly, in accordance with ISO 1024; or

b) indirectly, on relatively thin sheets (e.g. 0,22 mm and thinner), by determining the HR15T hardness in accordance with ISO 1024 and then converting the HR15T values to HR30Tm values using tabte B.2.

Make three hardness measurements on each of the test pieces taken in accordance with B.2.

Calculate the representative hardness for the consignment as the arithmetic mean of all the hardness measurements on all the sample sheets taken from the consignment.

To measure the indentation hardness, use a Rockwell superficial hardness testing machine, employing the 30Tm or 15T scales (see **ISO** 1024), as appropriate.

Carry out the tests on test pieces from which all organic coatings have been removed. Avoid testing near the edges of the test pieces because of a possible cantilever effect.

Table B.2 —Rockwell HR15T values and their HR30Tm equivalents

HR15T value	Equivalent HR30Tm value
92,0	80,5
91,5	79,0
91,0	78,0
90,5	77,5
90,0	76,0
89,5	75,5
89,0	74,5
88,5	74,0
88,0	73,0
87,5	72,0
87,0	71.0
86,5	70,0
86,0	6y,0
85,5	68,0
85.0	67,0
84,5	66,0
84,0	65,0
83,5	63,5
83,0	62,5
82,5	61.5
82,0	60,5
81,5	59,5
81,0	58,5
80.5	57,0
80,0	56,0
79,5	55,0
79,0	54,0.
78,5	53,0
78,0	51,5
77,5	51,0
77,0	49,5
76,5	49,0
76,0	47,5

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